

Model experiment on magma fragmentation in explosive volcanic eruption.

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Experiments on magma fragmentation using analogue materials, placed in transparent vessels, at moderate pressures and temperatures were carried out. The highly viscous material (starch syrup) were intermixed with nitrogen gas bubbles under 1.4 to 2.4 MPa, and loaded into acrylic test section. The foamy starch syrup were pressurized up to 2.4 MPa, and then rapidly decompressed to 0.1 MPa, which caused fragmentation and ejection of the fragmentation products into a large volume chamber. The process of starch syrup fragmentation was documented using dynamic pressure measurements. Independent viscoelasticity of samples were measured using rheometer simultaneously with the decompression experiments. The results of these experiments show that the rapid decompression of starch syrup can generates various shapes of the fragments depending on the temperature and the water concentration of starch syrup. They were similar to rock fragments generated by volcanic explosions: Pele's tears, Pele's hair, elongate to equant pumice and flat, pointed shards with smooth or conchoidal fracture.